CAUSES AND PREVENTION OF BLINDNESS IN COLORADO

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CAUSES AND PREVENTION OF BLINDNESS IN COLORADO

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This paper in devoted chiefly to setting forth statistics as to the causes of blindness in 1,203 cases in Colorado, 1,053 of them cases coming before the Colorado State Commission for the Blind and 150 of them drawn from private case records over a period of thirty years. Prevention of blindness depends on causing patients to seek proper treatment before irreparable damage to sight has been done; on proper diagnosis and care by physicians; on understanding by physicians of the causes of blindness, including general diseases; and on readiness to operate when necessary for the arrest or cure of ocular disease or for prevention of blindness in the second eye after one has been destroyed. Read before the Colorado State Medical Society, September 3, 4, and 5, 1929.

Medicine turns more to the causes and prevention of diseases and disabilities. Blindness, felt to be the greatest of disabilities to which we are liable, should properly be considered by the whole medical profession. The growth of specialism makes this more necessary. The beginnings of blindness are often in conditions that would never come first to the attention of the oculist; and the day for effective prevention has largely passed before definite eye symptoms command the attention of the patient.

Statistics of causes of blindness are lacking in many things that would add to their value. Those gathered in an earlier period do not apply for the present development of medicine. Those gathered in one part of the world would be misleading in another part. In different sections of this country the relative frequency of certain causes differs greatly. Different races, social conditions, occupations and prevalent diseases, present different causes of blindness. The general census, which accumulates so much information upon a wide range of subjects, including many for which specially qualified examiners are provided, leaves the matter of blindness to census takers. These get their information from people without any knowledge of the causes of blindness, and who may be interested in concealing the main facts. The census is notoriously inaccurate and incomplete in its conclusions as to blindness.

The statistics in medical literature are generally based on the experience of a single individual, or they partake of the deficiencies of the census. Even the records of institutions, or of authorities charged with the care of the blind, are far less complete and reliable than is to be desired. An institution deals with those who seek it, and with a few others heard of indirectly. State and local authorities have no direct means of knowing even the number of the blind within their jurisdiction; and very little about the real causes of blindness of those they have heard about. When definite reports on the condition of the blind are directly received, these are generally received so long after the condition leading to blindness that it is often impossible to assign the cause with confidence.

In Colorado the State Commission for the Blind, for the last four years, has been trying to get reports of all the blind within the state. The results of its inquiries are incomplete and often unsatisfactory. But they are in some respects more trustworthy than those accumulated in other states. To bring them to your attention may help in acquiring more complete and reliable information in future. So far as possible, the reports have been obtained from physicians devoting special attention to the defects and diseases of the eye. But, with the large area and scattered population of our state, reports from fully competent observers have not always been possible. Lists of members of the Colorado Ophthalmological Society were furnished to the county authorities, who first pass on all applications of the blind for assistance. An oculist's report upon the condition of each applicant is required, and arrangements were made to have, at the Colorado General

Hospital, expert examinations of all who might apply. But the importance of such examinations is not appreciated by all the county authorities, and in some parts of the state it seems not practical to bring applicant and skilled examiner together. Some very excellent reports have been received from general practitioners in isolated regions.

Applications for state assistance do not come from all the blind persons in a community, and some of them come from people who are not blind. Among those received were a few from persons blind in only one eye, but who had perfectly useful vision in the other eye; while in fifty-four the vision in the better eye range from 1/10 to 20/30. All such persons and all who did not conform to the standard for blindness, namely vision of less than one-tenth in the better eye, have been eliminated, leaving 1,053 cases from records of the State Commission for the Blind. To make the statistics more completely represent the conditions in Colorado, there have been added from the writer's private case records 150 cases of blindness, seen in private practice in Colorado within the last thirty years. This makes a total of 1,203 cases seen in Colorado, on which this paper is based.

Under "prevention of blindness" the editor of the American Encyclopedia of Ophthalmology says:

"The lack of accurate study on this subject is evidenced in the almost total absence of any large amount of reliable data and in the inexactness of those which are obtainable." "The records of most of our public institutions, as a basis for the study of statistical data concerning the amount of blindness which exists, seem to be absolutely worthless.

"It is evident that for scientific purposes the only records that are of any value are those which are made by trained and experienced ophthalmologists, but these are conspicuous by their absence where we would reasonably expect to find them."

It is well to understand why there is such a lack of accurate knowledge of the causes of blindness. Reasons for it have become evident in the work of the State Commission for the Blind in Colorado. In addition to the difficulty of getting good reports of "trained and experienced ophthalmologists", the greatest obstacle to securing satisfactory statistics is the long time that elapses between the beginning of a pathological process and its termination in blindness. A study of records of cases closely followed over long periods has shown that in a large proportion of cases of senile cataract as much as twenty years elapses from the beginning of the lens opacity until it produces practical blindness and forces the consideration of removal by operation. Even a disease that may be as terribly acute as glaucoma may in other instances last for ten years without causing the patient to seek relief from either pain or blindness. Trachoma may be contracted in childhood and only cause blindness when the distorted lids have caused rubbing of the cornea by misplaced lashes, during years of "weak" eyes and partial disability.

An individual blinded by smallpox at the age of two years did not seek a blind benefit until fifty-two years of age. Sufferers from congenital defects of the eye do not come under observation of an oculist until adult life. Cases of ophthalmia neonatorum are often neglected until they reach school age, without any close study of the conditions actually present. Adults with one eye practically blind from congenital defect may reach middle life before something happens to the good eye, to enforce the fact that it has done all their practical seeing.

Even persons who have become conscious of some serious defect consult one medical adviser after another, accumulating a miscellaneous collection of unrelated observations; later making it impossible to obtain anything like connected history of the condition observed. A patient with double papilledema, giving evidence of organic disease of the central nervous system, concealed the fact that two years earlier she had a breast removed for cancer. A young man with Leber's disease (familial optic

atrophy) persistently concealed the fact that two uncles had suffered from the same form of blindness; apparently because he knew of its unfavorable prognosis. This trait of human nature adds enormously to the difficulty of getting reliable statistics of the causes of blindness. It is for this reason that the 1,053 cases coming before the Colorado State Commission for the Blind have been supplemented by 150 cases drawn from private case records of the last thirty years.

The reports to the State Commission are often incomplete, but many show more than one condition that might have caused blindness, as cataract and glaucoma, or uveitis and corneal opacities. The lack of essential data often made it impossible to decide with certainty which of two or three conditions present was the real cause of blindness. The practical thing to do with such data is to mention what seems clearly the cause of blindness, or, where more than one cause for blindness is given, to mention each of the conditions that might have been the essential cause. This method does not balance the total cases by the sum of conditions present; it cannot show the exact percentage of cases due to each separate cause. But it does show what are the most important causes, those that should be guarded against and, so far as possible, eliminated in an effort to prevent blindness. It is from this point of view that the more important causes of blindness should be considered.

Cataract was noted in 460 cases as being present to an extent that might cause blindness. Less extensive opacities of the crystalline lens were present in many other cases. In eight cases the cataracts were congenital. In a few they were clearly, and in a larger number probably, traumatic. In five cases cataract was ascribed to diabetes, in a few to other general diseases, as influenza. But in a majority of cases they were clearly of the class called senile cataracts. In three instances they were specifically credited to "old age". The many impairments of nutrition that come with age leave wide room for further study, or for speculation.

Opacities of the cornea come next in frequency, 157 cases. This is a group in which there is great overlapping of causes. All the forty-nine cases arising from trachoma have opacities of the cornea, and these opacities are the chief cause of the blindness. All the cases ascribed to scarlet fever, 4, and to measles, 6, had corneal opacities. So had the 10 cases due to smallpox; the 16 cases, 9 certainly and 7 probably, due to ophthalmia neonatorum; the one case apparently arising from mumps; and one from typhoid fever. That was how four cases of pterygium caused blindness; and it was an essential part of all the 54 cases set down as "shrinking of the eyeball".

In 151 cases lesions of the retina and choroid, recognized by the ophthalmoscope, were set down as the causes of blindness. This includes 26 cases of angiosclerosis of retinal and choroidal vessels, but not the degenerative changes arising in myopia. There were two cases of obstruction of the retinal vessels and two of retinal hemorrhage, eight of renal retinitis, six of retinitis pigmentosa, one of circinate retinitis, and five of atrophy of the retina and choroid.

Atrophy of the optic nerve, 132 cases, was produced by syphilis in 22 cases (and probably in many more); in three cases it came from drinking wood alcohol, and in others probably from excessive use of ethyl alcohol and tobacco. Optic atrophy occurs in a rather wide range of general diseases, like cerebrospinal meningitis, influenza, mumps, lethargic encephalitis and disease of the hypophysis.

Glaucoma, in every case that goes on to blindness, shows optic atrophy. The cases of glaucoma, not included above, numbered 97. These were both primary and secondary cases, many being due to uveitis or to injury.

Uveitis, iritis, iridocyclitis, chronic or subacute, including two of tuberculosis, furnished 76 cases, besides 13 cases of acute panophthalmitis set down as the cause of blindness.

Injury was the cause of blindness in 66 cases. Among these were 21 caused by explosives, and 6 by gunshot wounds of the eye and orbit. Among the cases in which the injury caused blindness first in one eye were 17 in which the other eye was blinded by sympathetic ophthalmia. Lime burns caused blindness of both eyes in five cases. In one of these it was said that "both eyes were cooked". Detachment of the retina was noted in 15 cases, some traumatic and others myopic.

High myopia, with the degenerative changes that attend it, was clearly indicated in 43 cases; and was probably influential in causing blindness in other cases, especially of cataract. Blindness from myopia comes on very slowly, beginning in childhood and fostered by continued strain and neglect. It is surprising that even this many cases could be traced to their origin. Relatively it is a more important cause than these figures would indicate; since its share in causation of blindness interweaves with such widely separated causes as corneal scars, conical cornea, congenital dislocation of the lens, and cataract.

Other conditions that cause blindness appear in these 1,203 case reports. Congenital defects numbered 27, including, besides cataract, anophthalmos and microphthalmos 5, albinism 2, amblyopia 11, anomalies of the fundus 2. Vitreous opacities, given in 10 cases, are probably always associated with uveitis, or intraocular hemorrhage. Interstitial or parenchymatous keratitis was included with corneal opacities, which it nearly always leaves; and corneal opacities are always the way in which purulent (gonococcic) conjunctivitis, 4 cases in adults, causes blindness. Exophthalmos also causes blindness by corneal opacity, or by panophthalmitis. Erysipelas and apoplexy are mentioned. There was also one each of gunshot wound of the visual centers in the occipital lobe and of the optic chiasm, brain tumor, lethargic encephalitis, and fracture of the skull with vitreous hemorrhage.

Numerous conditions that have not been encountered, or mentioned in this study, may cause blindness. The prevention of all conditions causing blindness is a large undertaking. The prevention of blindness from any one of them is a matter of almost infinite detail. Manifestly we cannot now consider any of this detail; but from this review of the causes of blindness certain facts stand out that are of greatest importance in such prevention. It is a matter of close cooperation between eye physician, other branches of the medical profession, and the public. Prevention is going out to meet disease before it is manifest. This includes all measures of ocular and general hygiene in an age and civilization that lives by sight. But it also means the earliest recognition and treatment of the wide range of departures from health that may lead to blindness. In this sense, vascular and other degenerations may be prevented; and the whole body becomes the field in which to look for what may cause blindness.

Ocular lesions may be most likely to cause blindness; but prevention requires that their presence be discovered and their dangers understood early. Uveitis leads to blindness through a long course of attacks, incomplete recovery, and recurrences. It generally depends on extraocular causes. Focal infections must be looked for, not only in the teeth, tonsils, and sinuses, but in all other organs, if uveitis is to be permanently cured before it causes blindness through glaucoma, vitreous opacities, or choroidal atrophy. The underlying cause of cataract may be syphilis, diabetes, or parathyroid insufficiency. Causes must often be removed for effective treatment, and always for prevention.

To prevent blindness treatment must begin early and must be effective. It may be fifty years from the beginning of a myopia until it ends in blindness by cataract, detachment of the retina, or choroidal atrophy. There are usually years in which effective treatment of trachoma will prevent blindness, but later nothing may be of any benefit. Early treatment may preserve good sight in glaucoma. But when it has

caused blindness relief from pain is all that can be hoped for. The same is true of prevention of sympathetic ophthalmia. If optic atrophy can be checked, it is only by early treatment. The early treatment of all sorts of injuries to the eye will sometimes turn to a favorable result the doubtful situation that holds possibilities of useful vision and blindness.

The majority of eyes that become blind could have been kept with some sight by early proper treatment. The prevention of blindness depends on

(1) Persuading patients to seek good treatment at the earliest possible time.

(2) The readiness of physicians to recognize disease that may lead to blindness, when the eyes seem to be little if at all affected.

(3) The understanding that diseases which do not usually affect the eye may in some cases cause blindness and need to be watched with this in mind.

(4) The preparation of eye physicians to recognize the possible dangers of the conditions they treat; and their willingness to take responsibility for deciding when an eye should be taken out because it may endanger the sight of its fellow, or to operate, as for cataract or glaucoma, when this alone will prevent blindness.

It is a broad subject and only to be dealt with by broad study, broad view, and broad intelligence, on the part of the profession and of the community.

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PERFORATING INJURIES OF THE EYE BY SMALL STEEL FRAGMENTS

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DETROIT

A number of cases of injury by small particles of steel are briefly described, to illustrate (1) the direct ratio between severity of injury and size of foreign body; (2) the influence of the location of entrance upon the amount of permanent disturbance; (3) the occasional freedom of the crystalline lens from important opacity secondary to its penetration by steel fragments; (4) the difficulty of removing steel fragments from the crystalline lens after the capsule is once healed; (5) and the problem whether a very minute steel particle may ultimately be quite absorbed and disappear from the tissues of the eye. Read before the annual meeting of the Michigan State Medical Association, September 17, 18, 19, 1929.

My audience may wonder how I should expect to extract anything of particular interest from a subject that has amassed such a voluminous literature and whose every angle has been searched and commented upon.

My answer is that in the state of Michigan, largely through the development of the automobile and accessory industries not only in the larger cities but in most of the smaller towns, ophthalmologists have had unusual opportunities for observing injuries of the eye by steel fragments and might be expected to have accumulated, in the course of twenty-five years, experiences in caring for these injuries that would be worth relating.

Furthermore, inasmuch as I am limiting my subject to injuries of the eyes by small steel fragments, and chiefly to damage affecting the crystalline lens, and since the case records at my disposal are sufficiently numerous to illustrate fairly well the various themes that I shall present, I am hopeful that my paper will have a substantial value.

The damage done to the eye in foreign body injuries is directly proportional to the size of the foreign body.

This is a general rule with exceptions. Accidents from large foreign bodies usually result from considerable violence. As examples I may mention the breaking of a high-speed drill, the faulty action of a punch press, and frayed edges of punches flying from the blows of a hammer or sledge.

Injuries by large foreign bodies shatter the eyeball. Large rents of the cornea or sclera result with extensive loss of vitreous. The lens is expelled or ruptured. The globe collapses or, if it retains its shape, is filled with blood.

Perforating injuries of the cornea by foreign bodies of moderate size are characterized by irregular corneal wounds and emptying of the anterior chamber. The iris is prolapsed or becomes attached to the corneal wound. Tearing of the iris or ciliary body results in bleeding into the anterior chamber or vitreous. If the lens is injured, the capsule wound gapes and lens matter is soon extruded into the anterior chamber.

The most frequent cause of perforating injuries by small steel fragments is the workman striking a piece of hardened steel with a hammer. I could relate numerous incidents of superintendents, foremen, and skilled mechanics regretting too late the gentle tap which in a moment of carelessness they gave to hardened steel. The use of lead and brass hammers has perhaps diminished the occurrence of such accidents, but I have seen perforating injuries follow even their use. The history of such an accident is sufficient to make the ophthalmologist undertake a most searching examination of the eye and he must indeed be very sure of his ground if he dispenses with an x-ray examination.

In injuries by small foreign bodies the corneal wound is smooth and may be so inconspicuous as to be missed easily on inspection. The anterior chamber is not evacuated. The iris may exhibit a punched-out hole or a notch in the pupillary margin. If the lens is injured the wound in the anterior capsule shows a tendency to close promptly and the lenticular opacity resulting remains partial, or if it pro-

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